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NPIC/TSSG/RED/ATB-1855-69
8 October 1969

MEMORANDUM FOR: Acting Chief, Advanced Technology Branch, RED

SUBJECT: Trip Report [redacted] 25X1

On 26 September 1969 I discussed a wide variety of topics with Messrs. [redacted] 25X1
25X1 [redacted] This memorandum is intended as a brief review of these discussions.

a. Light Table Lighting Characteristics - I was provided an overview of a most informal subjective evaluation of light table lighting sources by [redacted] 25X1 He recommends a source to view "color materials" with the following characteristics: 5000°K to 5400°K (preferred) color temperature; at least 2000 foot lambert luminance capability. He sighted a new ASA recommendation along these lines. He further noted that at least 20 foot lamberts through 2.0 density film is required for [redacted] 25X1 monocular viewing device. No comment was made relative to the use of Zoom 70 or Zoom 240. I must place little value in the study because of the informal nature of the experimental design and the fact that the light source must be tested with a variety of types of imagery. On the other hand, the study represents a start in the right direction, and it does provide at least minimal data.

b. Potential Uses of Color Material - These appear to lie in the general areas of: agriculture, industry, mining, manufacturing, building processes, waste, identifying color-coded targets, and human distrubances of nature. I stressed that perhaps the color photography applications would eventually fall into two broad categories: target conspicuity (search) and target identification (location known).

c. Projects Kaleidoscope and Insight - both are software exercises which treat the multitudinous effects of atmospheric, acquisition vehicle and exploitation hardware characteristics

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on black/white, and eventually, color photography. In simplest terms, Kaleidoscope is a "Spectral Energy Acquisition Model" which predicts what the imagery will look like, given information regarding the target, atmosphere, vehicle, and exploitation hardware (light table). Insight, on the other hand, is an "Analytical Spectrum Model", which treats the imagery as a radiometer. The model allows one to postdict what the spectral characteristics of the ground scene "really are", given the imagery. These two projects are in the most elemental stage, of development at the moment, but they hold promise of being quite beneficial to the community's color exploitation efforts.

d. Equipment Needs - Color research, particularly at it applies to treating a film as a re-raditor (Project Insight), points clearly to the need for a much more sophisticated spectral radiometer than is currently available to [redacted] 25X1 lab personnel. I did not determine what gear they currently have on board. Perhaps APSD may be of service here.

e. Requests for Research Topics - [redacted] 25X1 was most interested in determining what color oriented questions we in the Center might have. He will soon draft a proposal for a follow-on to a "non-NPIC" contract. He is seeking assurance that their work will be "most appropriate to the Center's and to the community's needs." I refrained from offering tasks pending determination of the source of [redacted] 25X1 funds and the resolution of NED contractual efforts in the color field. Messrs. 25X1 [redacted] will be visiting the Center in the next several weeks, and I am quite certain this topic will arise again.

f. Assists for Color Exploitation - [redacted] 25X1 is hard at work with [redacted] (IEG) to assist the Center in reading out the next color mission(s). It is proposed that 25X1 [redacted] representatives be on hand to determine and employ information from Projects Kaleidoscope and Insight. In addition, 25X1 [redacted] suggested booklets of Munsel Color Chips and modified chromaticity diagrams be provided to the interpreters, such that they and the analysts will have a means of "objectively" specifying (to a degree) the chromatic nature of targets of interest. I view this approach as being a quite

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reasonable first step in controlling the exploitation of color imagery.

g. Rear Screen Projector Development - [redacted] demonstrated a rear screen projector fabricated from a binocular microscope and two fresnel lenses. A camera adapter (with a prism attached) was fitted to the microscope, and a high intensity arc light source (I do not know the specifications) replaced the conventional light source of the microscope. The optics within the scope were not altered, as far as I know. A pair of images (same scene), focused at or near infinity, were then projected via the prism arrangement to two fresnel lenses, thereby permitting multiple observers to view the scene. The cost of the materials was less than [redacted] excluding the microscope. 25X1 25X1

I could resolve approximately 1500 lines per milimeter (tribar target) at a high but unspecified magnification, and I was told that at least 1.8 foot candles could be read (open gate) through each lens at this unspecified magnification. I had no complaints regarding image density at the high magnifications, but I was disappointed in the directionality of the image plane (due to the fresnel lenses). [redacted] noted that [redacted] "Day View Screen" appears to be a good substitute for a fresnel lens, since it is not so unidirectional and hence can be observed by several interpreters at a time. I recommend that Messrs. [redacted] view the setup the next time they are in the [redacted] area. 25X1 25X1 25X1 25X1 25X1

h. A Resolution Test Development - [redacted] has completed preliminary investigations on several alternatives to the Air Force's tribar resolution target. On the basis of his findings, he has concluded that detection is tied to resolution, while shape recognition is a function of size (microns^2) for a given resolution. To date, he has generated a series of test materials over a wide density range. A resolution test consists of modified [redacted] spiral targets - a series of progressively smaller light circles within which are arrayed from 1 to 3 pairs of dark bars in random orientation to one another. Two tasks were levied upon the observer: (1) note the smallest circle wherein each pair of lines was resolvable; (2) note the smallest circle wherein any change in density 25X1 25X1

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was detectable. It is the latter measure which has been selected as the criterian of detection, and which lead to the generation of a revised detection test containing circles with but a single line per circle. [redacted] notes that the single bar test is measurably "simpler" to use than the tribar targets, and while sufficient comparisons between the two tests have not been undertaken as yet, the single bar test may result as being a feasible alternative to the tribar configuration. 25X1

The shape recognition tests consist of a series of equal size squares and circles, differing in contrast from one another and from a uniform background. Earlier research utilizing 10 simple geometric figures (squares, hexagons, triangles, and so forth) indicated that squares and circles were most representative of the total stimulus array and could be utilized with comparable results but at a greatly reduced time expenditure. The same principles have been applied to a new color-oriented shape recognition test. No data has been collected with the color test as yet, since the test material was completed shortly before my visit.

[redacted] 25X1
Chief, Human Factors Section, ATB

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